



Supporting Illustrations

Blue Ribbon Commission Reactor and Fuel Cycle Technology Subcommittee

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The Need for an Energy Return on Investment (EROI) Metric for Fuel Cycles

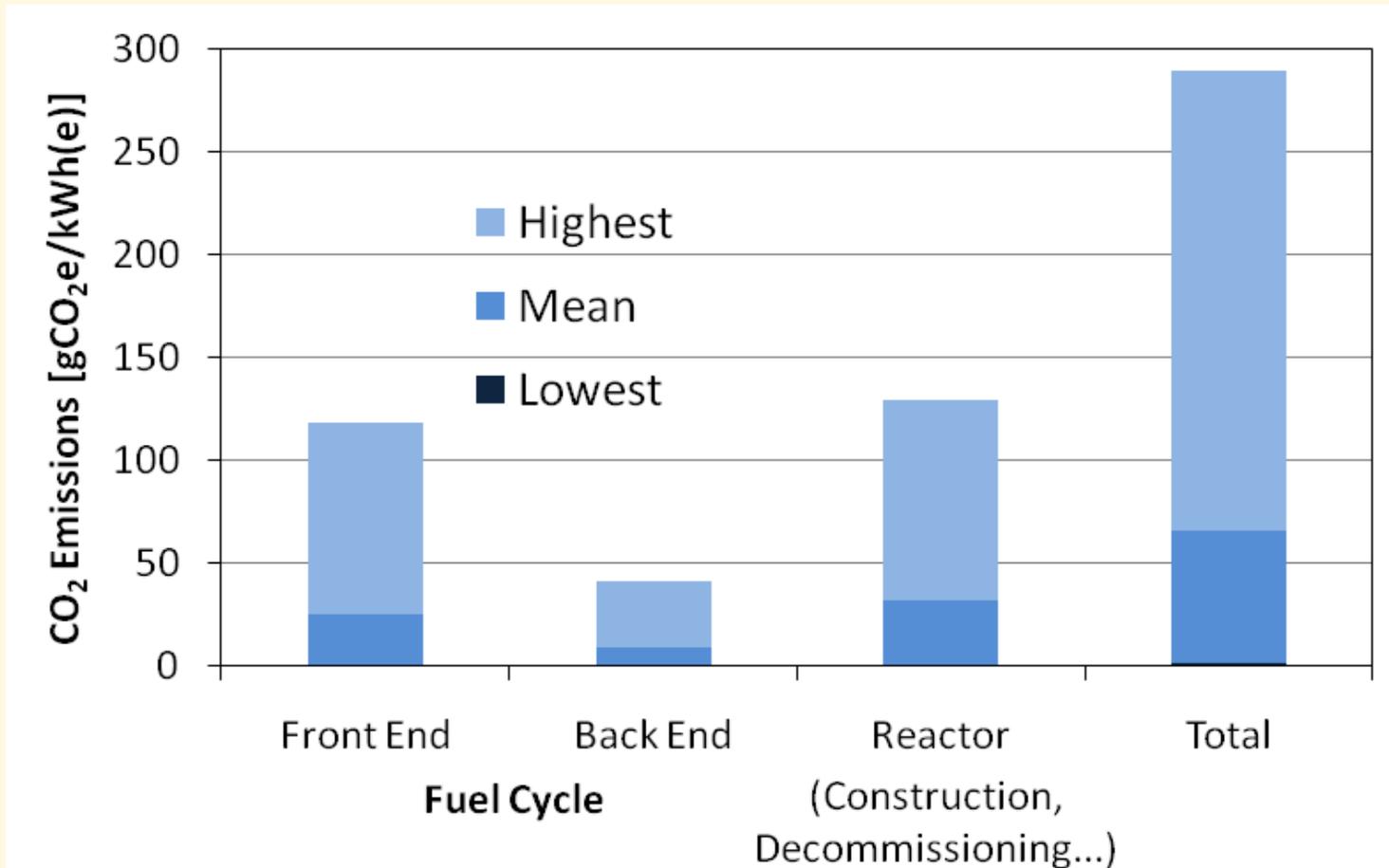
- “Nuclear power results in up to 25 times more carbon emissions than wind energy, when reactor construction and uranium refining and transport are considered.”
 - M. Jacobson and M. Delucchi, “A Path to Sustainable Energy by 2030,” *Scientific American*, November 2009.
- This claim may be made in a respected forum because the energy balance of the fuel cycle (even contemporary once-through) isn't well understood
 - this is particularly true of indirectly consumed energy **embodied** in chemicals, concrete, machinery, etc.
- The evolution of the energy balance as we continue extracting the uranium resource may be especially important.



CO₂ Emissions from the Once Through Fuel Cycle: 19 Estimates from the Literature



- Directly related to **energy consumed per unit energy produced**

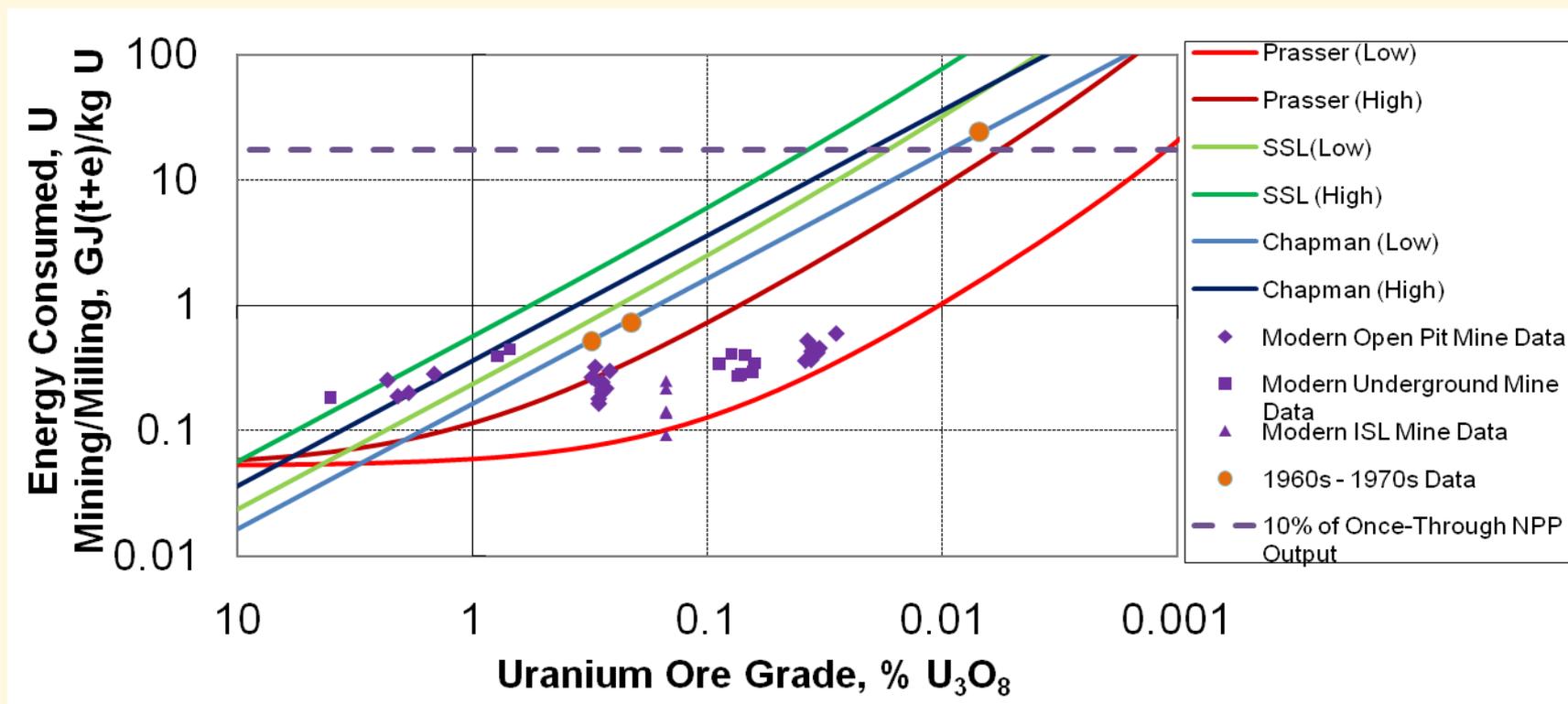


Data source: Sovacool, B. K., "Valuing the Greenhouse Gas Emissions from Nuclear Power: a Critical Survey," Energy Policy **36**, 2940-53, 2008.



Energy Intensity of Uranium Mining & Milling: Data and Forecasts

- The contemporary industry average ore grade is 0.1% U_3O_8
- Note: mines only report **direct** energy consumption (points): some of the grade-to-energy consumption estimates (lines) include **indirect** energy as well



Models: Chapman, P., Energy Analysis of Nuclear Power Stations, *Energy Policy*, pp. 285-298, Dec 1975;

(SSL): Storm van Leeuwen, J., and P. Smith, "Nuclear Power, The Energy Balance," 2005. Revised 2007.

Prasser, H., Bayard, S., and R. Dones, "Sustainability of Uranium Sources," *Proc. International Conference on the Physics of Reactors "Nuclear Power: A Sustainable Resource," PHYSOR 2008*, September 14-19, 2008.